"I always wished that I could go swimming in the Great Lakes ... but I've never had the chance to do that and I hope someday my kids or the future generation will have the chance to do something like that."

High School student,

1989 Biennial Meeting

Fifth Biennial Report on

Great Lakes Water Quality

Part I

International Joint Commission

Commission Offices:

2001 S Street N.W., 2nd Floor
Washington D.C. 20440

100 Metcalfe Street, 18th Floor
Ottawa, Ontario K1P 5M1

Great Lakes Regional Office
100 Ouellette Avenue, 8th Floor
Windsor, Ontario N9A 6T3

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FIFTH BIENNIAL REPORT UNDER THE GREAT LAKES WATER QUALITY AGREEMENT OF 1978 TO THE GOVERNMENTS OF THE UNITED STATES AND CANADA AND THE STATE AND PROVINCIAL GOVERNMENTS OF THE GREAT LAKES BASIN

PART I

COMMISSIONERS

Gordon K. Durnil
E. Davie Fulton
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Robert S.K. Welch
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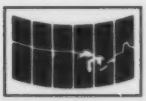

International Joint Commission
United States and Canada

International Joint Commission

Fifth Biennial Report on Great Lakes Water Quality, Part I

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INTRODUCTION

The International Joint Commission is required to report to the Governments of Canada and the United States at least biennially on its findings with respect to the implementation of the Great Lakes Water Quality Agreement. Normally the Commission's Biennial Reports made after each Biennial Meeting reflect primarily the results of the Commission's consideration of the reports of its Great Lakes Water Quality and Great Lakes Science Advisory Boards for the two years since the preceding Biennial Report. This Biennial Report is also prepared with the benefit of having available to us the substantial and useful reports of these Boards. However, we have concluded that, on this occasion, the Report should also discuss specifically the input we have received from the public, and particularly the public input at the Biennial Meeting itself.

Increasingly in recent years, reports concerned with the Great Lakes from nongovernmental organizations such as Sierra Club, the Rawson Academy, Great Lakes United, Greenpeace, and the notable work of the Conservation Foundation and the Institute on Research in Public Policy (*Great Lakes, Great Legacy?*) have become available, not to mention the broader literature on various pertinent subjects. All of these documents, together with the organization and increasing activity of these institutions in the Great Lakes field, reflect the increasing knowledge and consequent concern on the part of the general public regarding the gaps in implementation of the Agreement. These organizations are com-

posed of and directly represent many thousands of Great Lakes basin residents living on both sides of the international boundary, in all jurisdictions and municipalities and from all walks of life.

Many of the conclusions and recommendations in the reports referred to above, and much of the public input received at the Commission's fifth Biennial Meeting in Hamilton, Ontario, reinforce conclusions and recommendations which have been previously submitted to the Commission from its Water Quality Board and Science Advisory Board and communicated to the Governments of Canada and the United States by the Commission.

The increasing level of public concern for the Great Lakes ecosystem and insistence on governmental response to Agreement objectives were strikingly evident, and outspokenly vented, at the Commission's recent Biennial Meeting. Because of the importance — and the abundant evidence this occasion provided — of public support and individual demands for government action, we concluded that we should deal specifically with that meeting in this Report.

As we came to draft the Report it further became clear that the contents could in fact appropriately be divided into two parts, one dealing with the broad matter of concern over progress, or lack of it, as expressed at the Biennial Meeting, and the other dealing with the more detailed aspects of what must be done to implement the Great Lakes Water Quality Agreement. Accordingly, this year our

Biennial Report is so divided. Since the other matters require more time to complete and there is some urgency in advising governments of the public concern, we have concluded that we should submit this completed portion, dealing with the Biennial Meeting, as Part I of our Biennial Report. Part II will be completed and delivered with all due dispatch.

1989 BIENNIAL MEETING

The Commission's fifth Biennial Meeting was held in Hamilton, Ontario on October 11, 12 and 13, 1989. The meeting was noteworthy by reason, amongst others, of the excellent facilities provided and the warm hospitality extended by the Mayor and Council of the City of Hamilton. It is noted with pleasure that the high quality of the reception accorded to us by the City of Hamilton is matched by the diligent efforts being made to restore the quality of the waters in Hamilton Harbour and the surrounding area.

The meeting was remarkable, however, not only for the quality of the external arrangements, but also for its internal content in terms of the number of members of the public taking part and the quality of their presentations. Not only were there a record number of individuals present, and participating by way of presentations, but since they included persons speaking for the representative organizations mentioned above as well as others, it is true to say that the Great Lakes population was indeed well represented.

There were frequent and enthusiastic comments on the way in which this meeting had been organized to give the public an opportunity to participate and express their views, and the extent to which that participation had taken place. But it must be recorded that, while the members of the public were enthusiastic in their praise for the opportunity to participate, this was not so with regard to their assessment of progress made under the Agreement — in fact the exact opposite was the case. Although there was occasional

recognition of and expression of support for progress made in certain isolated areas or respects, there was virtual unanimity of opinion that real progress towards achievement of the Agreement's objectives is sadly, if not totally, lacking; further, that responsibility for this fact must be faced and accepted by the Governments of the United States and Canada who have the overall responsibility for ensuring that the objectives of the Agreement are put into effect in order that its principles and purpose may be attained.

This is not to say that the Commission itself and its Boards were not also subject to criticism. They were, and it is our intention to analyze and consider those criticisms carefully and fully and to take action as appropriate. To some of them we shall in fact respond in later sections of this Report. But in view of the extent and weight of the criticisms — and suggestions — with respect to the areas where the Parties in particular or governments in general must accept responsibility, and in view of our advisory role as set out in the Agreement, we consider it our responsibility to bring to the attention of the concerned Parties and other governments the effect and weight of those criticisms and/or suggestions.

This may most appropriately be done in two sections, dealing first with those criticisms and/or suggestions concerned with matters of a general or background nature, and secondly those dealing with specific items or areas of the Agreement itself. The Commission notes that while much of what was said at Hamilton is

consistent with previous and current Board and Commission views, we do not necessarily concur with all concerns and views expressed at that time, many of which are reflected in the following pages.

GENERAL COMMENTS PROVIDED BY BIENNIAL MEETING PARTICIPANTS

One theme was common to most of the presentations which we heard: the time has come to translate the principles, purposes and objectives of the Agreement into enforceable law(s) and to ensure that those laws are in fact enforced. There were a number of variations of this theme — ranging from the suggestion that there has been enough scientific research to establish the danger and that enactment of laws prohibiting the creation and/or discharge of dangerous pollutants is now the essential requirement, through suggestions for broadening the base or scope of such research, to the view that enforcement action is the main priority or need — that basic laws are now in place, but the necessary drive to enforce them is what appears to be sorely lacking. As we shall be making our recommendations in Part II of this Report, we will deal here with the broad issues only.

Reverse Onus A common statement was that the principle of reverse onus should be incorporated into whatever laws are enacted. In effect, this means that where approval is sought for the manufacture or discharge of any material or substance that will or may enter the environment, it should not be necessary for anyone to prove that the discharge will or may be harmful, but should be necessary for the applicant to prove that the discharge will not be harmful.

Standards The criticism was made that to date no lakeshore government (state, provincial or municipal) — and neither federal

government — has in fact enacted programs that would give full effect to the philosophy of zero discharge. In the same context, criticism was voiced that too frequently there are departures from standards, or failure to enforce requirements, which are or should be incorporated in remedial action plans (RAPs), and the concomitant suggestion/criticism that the lakeshore municipalities and other local authorities — which are greatly affected by RAP implementation — are not made active partners in the whole Agreement implementation and enforcement process. It was also suggested that RAPs should be made legally enforceable.

Legislation and Regulations A number of criticisms/suggestions were made to the effect that it should be a requirement that the Commission review all proposed legislation and/or regulations dealing with what is permitted to be, or prohibited from being, discharged into the Great Lakes Basin Ecosystem before they are enacted, and report on the extent to which they conform, or fail to conform, to the purpose and objectives of the Agreement. An example was given of recently introduced state legislation on the subject of controlling discharge which completely ignored, if it did not contravene, the spirit if not the letter of the Agreement, insofar as the elimination of dangerous toxic substances and achievement of zero discharge are concerned.

Numerous submissions endorsed the position that it is essential that the principles of the Agreement be incorporated into

enforceable legislation now; that while remedial and cleanup measures are important, they must be secondary to enactment and enforcement of preventive legislation — because without prevention at the source, remediation is but a sop and cannot be an answer to the problem. While there were also suggestions worthy of consideration that governments should ensure that RAPs and other remedial measures require those responsible for the pollution to pay for — or at least contribute substantially to — the cost of cleanup, this is perhaps subordinate to, if not incorporated in, a general principle that was universally supported.

That principle was that, with respect to both the enactment of preventive measures and the enforcement of penalties for infractions, there must be an end to the "business as usual" attitude: there must be strict application and enforcement of zero discharge and other restrictions as appropriate, and meaningful penalties for violations. The theme that the time has come when the principle of the Agreement must be given the force of law, providing for prohibition of the creation and/or discharge of dangerous substances and for appropriate penalties for breach, and that attention to this requirement should be given top priority, was either specific or inherent in the great majority of submissions made at the meeting, and was greeted with strong applause by all whenever it was proposed.

One specific suggestion as to how this general objective

might be accomplished was made by two or three of the participants, and deserves specific mention. That was, that the provisions of the Agreement, amended to give effect to the prohibitory and penalty suggestions referred to above, should be embodied in a formal Treaty between our two countries. Those provisions, in this view, would thus be given the force of law consistently throughout the basin and, in the words of one participant, "thus bring together legalities and ethics" with respect to our responsibility to preserve the environment.

SPECIFIC COMMENTS PROVIDED BY BIENNIAL MEETING PARTICIPANTS

Considerable concern was expressed that there is unnecessary delay, or at least uncertainty, in preparing a comprehensive list of those substances which are designated as pollutants which must be barred, and enacting the appropriate provisions. In this context several submissions were made to the effect that while the impact on human health is an important criterion in determining whether particular substances should or should not be on such a list, proven human health effects should by no means be the sole or final determining criteria.

Here it was pointed out that from an ecosystem perspective, all elements of the environment — human, animal, vegetable and others — are interdependent, and that what is a detriment in the long term for one element will inevitably be a long-term detriment to others. It was emphasized that there are volumes of specific evidence of harmful effects of particular substances on animal, bird and fish life in the Great Lakes basin, and that having regard to the urgently necessary objective of preserving the integrity of the ecosystem, no further time should be lost in including substances known to be harmful in that context on the list of prohibited or controlled substances under the Agreement; and, again, in translating those prohibition and control provisions into effective and enforceable laws and taking coordinated action to enforce them.

Demonstrating Zero Discharge Several other specific suggestions or recommendations should, we think, at least be mentioned

in this Report. One that came from several sources, and received widespread indications of support, was that a start should be made now, at least on a trial basis, on a program of zero discharge. It was specifically recommended in more than one submission that a start should be made by using Lake Superior as a test case. Reasons put forward in support of this suggestion included the fact that the Lake Superior area is not as intensively industrialized as the other lakes, and thus a test or trial run to identify the problems and practicalities of such a program would be less difficult there. Further, the lessons could be applied immediately on a basinwide basis, and it was felt that Lake Superior is a good starting point for such a cleanup effort since its waters are eventually distributed throughout the entire system. One other important matter of detail, the subject of a widely supported submission, should be noted. This related to the subject of zero discharge, and the trial or test run suggested for Lake Superior. It was also suggested, and appeared to be widely supported, that an immediate ban be placed on the use of chlorine in the process of pulp and paper production.

Continuing Citizen Input A related criticism/suggestion was that the Commission and its Boards are not in sufficiently direct contact on a continuing basis with the lakes and their problems, and that the Commission should set up a citizens' advisory board for each lake in order to receive continuing and practical public input on the problems that exist and the means and progress with respect

to their elimination. This reflects a continuing and growing expression of concern provided on other occasions that sufficient arrangements are not in place to ensure public input into such questions as, where are the problems and what is required by way of preventive and remedial measures, nor to secure public involvement in the design and implementation of specific remedial measures.

Involving Native Peoples A closely related criticism and concern was expressed by several representatives of Native Indian Bands or Associations who made submissions. They pointed out that their people have for centuries been dependent on, but lived in harmony with, their environmental surroundings — that they have been in truth a harmonious part of the ecosystem. Since they still rely on the integrity of the ecosystem to a greater degree than the non-Indian population, they are more directly and adversely affected by disruptions of that system. They asked for greater appreciation of this situation and greater opportunity for effective input and acceptance of their view that prevention at source, not cleanup after the event, is the only practical and effective approach to the problem of maintaining the integrity of the ecosystem.

The Commission's Agenda for Public Consultation In connection with the two last mentioned criticisms and suggestions, the Commission announced at the meeting itself that measures are under development which should result in appropriate response. First, with respect to public input, a commitment has been made and

plans are now being completed for a series of roundtable conferences at various sites throughout the basin to discuss specific Agreement-related problems. It is expected, and intended, that these will result not only in the immediate opportunity for public participation, but also in the development of concrete and workable plans for public input on a continuing basis and at satisfactory levels.

Public Education and Responsibility Closely related to, but requiring separate consideration from, the matter of public input is another matter receiving mention: the necessity for public education, not only as to the extent and imminence of irreversible damage to the environment and the urgency for measures to meet that threat, but also the extent to which those measures will require acceptance of substantial alterations in many of our ways of or approach to living, as well as of the substantial costs of those measures. In this context, it was interesting to observe that while there were strong and generally accepted views that those members of the industrial and commercial community who create and/or release the damaging substances must bear a fair and proportionate cost of implementing the new approach, nevertheless there seemed to be a prevailing opinion that there will inevitably be a substantial cost to be borne by governments — that is, the general citizenry of our countries — and that those citizens are, in general, prepared to accept this cost as the unfortunate but necessary price of saving the

environment.

On the subject of public education emphasis was repeatedly placed on the necessity for our school system to introduce to all children, from the earliest age, knowledge and understanding of our interrelationship with the environment, of our dependence on the integrity of the ecosystem of the basin, and of the responsibility of each individual and the community to ensure that nothing in human conduct is allowed to imperil that integrity. This theme was reflected also in the comments of several high school students who reported on the results of a day-long educational conference called "The IJC, the Great Lakes and You," held earlier in the week. A number of goals for the year 2020 were developed by the students, together with specific projects that could be undertaken to demonstrate environmentally-sensitive behaviour in their schools and communities. The expectation of a more hopeful future and the recognition of personal responsibility to help achieve it underlay much of this commentary.

As stated above, the purpose of Part I of our Report primarily is to bring to the attention of the Governments of Canada and the United States the concerns of the public about Agreement-related problems. With respect to certain of these and other matters, we will be making recommendations in Part II of the Report. With respect to matters of internal organization or conduct of the Commission, relevant actions proposed or underway have been indicated above. This leaves the broad area of enforcement of Agreement principles and objectives — the general subject for which there was expressed such widespread concern and unanimous agreement that positive steps to translate Agreement objectives into effective and enforceable legislation are desperately needed.

On this matter we believe that it is so vital that there be continued public confidence in and support for the Agreement and Agreement-related activities, and that the grounds for concern are so real, that we should bring this public concern to the attention of the Parties and jurisdictions at the earliest moment. That is the purpose of this Part I of our Biennial Report.

As to conclusions and recommendations, these will be included in Part II of the Report, which will follow shortly. In that document we shall incorporate some of our conclusions on specific matters drawn from consideration of the reports of the Water Quality and Science Advisory Boards and other reports and input, together with our recommendations based thereon. We shall

incorporate also recommendations based on our conclusion with respect to the matter of Agreement enforcement discussed in this Part, which conclusions however will in turn be drawn from a consideration not only of the public input at the Hamilton meeting but also of our Board Reports as well as of various other sources of input. That broad spectrum of input will in turn be the base for the specific recommendations set out in Part II.

Signed this 8th day of February 1990 as Part I of the Fifth Biennial Report of the International Joint Commission pursuant to the Great Lakes Water Quality Agreement of 1978.

Gordon K. Durnil
Co-chairman

E. Davie Fulton
Co-chairman

Donald L. Totten
Commissioner

Robert S.K. Welch
Commissioner

Claude Lanthier
Commissioner

"... from an ecosystem perspective, all elements of the environment — human, animal, vegetable and others — are interdependent, and what is a detriment in the long term for one element will inevitably be a long-term detriment to others."

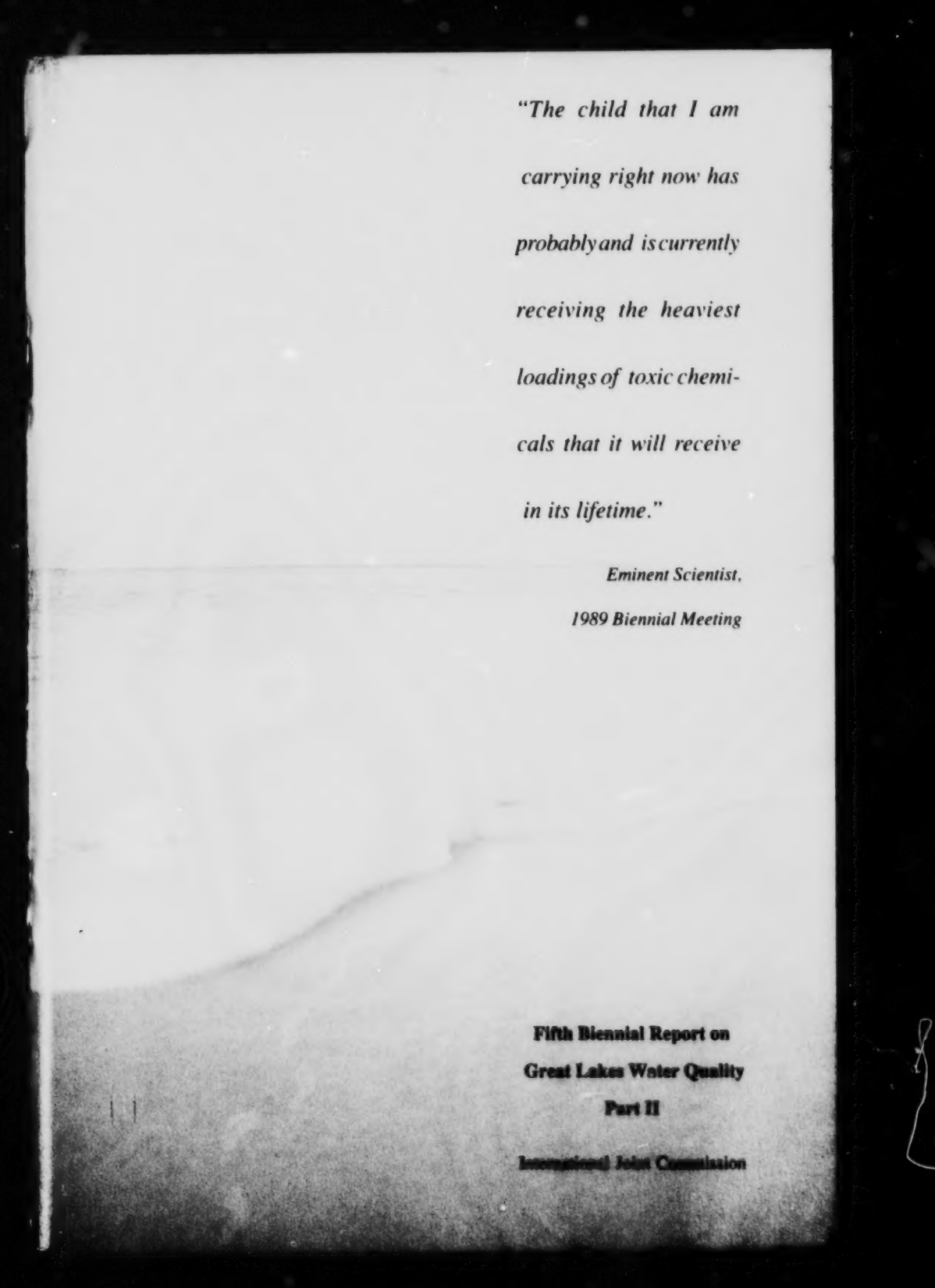
Fifth Biennial Report on Great Lakes Water Quality Part I

Volume

2

"The child that I am carrying right now has probably and is currently receiving the heaviest loadings of toxic chemicals that it will receive in its lifetime."

Eminent Scientist,
1989 Biennial Meeting



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PART II

IJC COMMISSIONERS

Gordon K. Durnil
E. Davie Fulton
Donald L. Totten
Robert S.K. Welch
Claude Lanthier
Hilary P. Cleveland

International Joint Commission
United States and Canada

International Joint Commission, 1990

Fifth Biennial Report on Great Lakes Water Quality, Part II

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INTRODUCTION

This report is being released on the eighteenth anniversary of the first Great Lakes Water Quality Agreement, signed on April 15, 1972. The Agreement has come of age, and enough time has passed to test the will of the Governments of the United States and Canada (the Parties) to implement its provisions. Renewed and expanded twice, in 1978 and 1987, the Agreement commits the Parties to a range of programs and other measures to restore and maintain the integrity of the waters of the Great Lakes Basin Ecosystem. The International Joint Commission monitors and reports progress at least biennially.

This is the second part of our Fifth Biennial Report. It is based in part on the 1989 reports of the Great Lakes Water Quality Board and Great Lakes Science Advisory Board, but also takes account of information from a number of other recent reports about the Great Lakes. In addition, it reflects our consideration of comments received from nongovernmental organizations and individuals at the Commission's Biennial Meeting of October 1989. A more detailed review of those proceedings is contained in Part I of this report.

Scope of Our Report It is not our intention to provide herein a comprehensive report on all subjects of importance to the Great Lakes. Rather, this report highlights issues we conclude need urgent and focused attention:

- the threat posed by persistent toxic substances to the

ecosystem, particularly human health;

- Agreement implementation at the state, provincial and local levels;
- remedial action plans;
- spills; and
- exotic species.

Other topics will be the subject of Special Reports at a later time.

Agreement Progress Progress over these 18 years has been mixed. Governments at all levels have put into place action programs to achieve the objectives and goals of the Agreement, but in limited ways. Particular attention has been given to those environmental issues which have been well defined and manageable. The most obvious example is the progress made in eliminating huge quantities of nutrients and other chemicals from sewage, thus reducing the unsightly and noxious symptoms of eutrophication in the Great Lakes. Severe limits placed on certain high-profile chemicals such as DDT and PCBs resulted in plummeting levels of those contaminants in the environment, with notable recovery in some affected wildlife species. In addition, increasing interactions between and within jurisdictions on both sides of the international boundary have led to a blossoming of information sharing, cooperation and better understanding between researchers and officials.

At the same time, however, many other programs have

faltered. Research funds increasingly have been insufficient to meet Agreement requirements. The number of personnel in research and enforcement has been inadequate. Many of the Commission's recommendations and those of its boards have gone unanswered. Attempts to regulate have only partially stemmed the inflow of pollutants, and we are far from achieving virtual elimination of persistent toxic substances. Several thousand toxic chemicals continue in commercial use, with others added every year, often without thorough testing or sufficient understanding of their potential effects on human health and the overall welfare of the Great Lakes Basin Ecosystem. Early decreases in certain persistent toxic chemicals have leveled out above presently acceptable targets, and no clear strategy has been established to achieve further reductions.

The environment has become a priority social and political issue — locally, nationally and globally. Yet there are many competing issues when it comes to providing resources. Unfortunately, each nation's rhetorical commitment concerning "best efforts" to meet the Purpose and General and Specific Objectives of the Agreement has not been enough. What has been, and continues to be lacking, is a level of resource commitment congruent with the admirable pledges each nation took upon itself in signing the Great Lakes Water Quality Agreement. Sufficient levels of financial and human resources to implement the provisions of the Agreement,

including Agreement-related research and the restoration of beneficial uses in degraded Areas of Concern, will be an important yardstick by which the Commission will measure governmental performance in the 1990s.

The Parties alone cannot provide all of the resources required to implement the Agreement. Support and participation is also essential by state, provincial and municipal governments. Individuals as well as professional, citizen and research organizations and the business sector must also be part of the quest to achieve the goals of the Agreement.

The emergence of strong, sophisticated and effective non-governmental organizations over the past decade has been a positive development. Composed of many thousands of Great Lakes basin residents and others from both sides of the international boundary, these organizations are important in focusing political attention on the integration of Agreement objectives into domestic priorities and programs. They are instrumental in encouraging governments to provide the resources necessary to implement the Agreement and actively promoting environmentally conscious behaviour among their own membership and the public at large. As such, these organizations fill a distinct niche in the Great Lakes institutional framework and continue to play an important role in the development of advice to the Commission, the Parties, and the states and provinces.

The Great Lakes are an immeasurably important resource. They are ecologically important in their own right: the home of many species (some now extinct) and one of the greatest reservoirs of fresh water in the world with all its hydrological, meteorological, geological and biological implications. They are also the economic and social lifeblood of a large part of our two countries. They provide drinking and irrigation water, fisheries and wildlife habitat, transportation, power, processing water, recreational opportunities and many other services to humans living in and outside the Great Lakes basin.

The Great Lakes have, and must be seen as having long-term, permanent importance. Indeed, the Great Lakes region (due in large part to the programs that have emanated from the Agreement) has generated research, remedial programs and institutional processes, as well as public participation in the identification and resolution of issues, that have been harbingers of progress in other regions of North America and the world. Both nations must remember this, take pride in it, and increase their commitment to their responsibilities under the Agreement.

Summary The philosophical roots of the Agreement lie in restoring and maintaining the environmental integrity of the Great Lakes. This philosophy serves as a springboard to a range of economic, social, ethical, moral and intergenerational issues. All must be seen as the context for some quite specific commitments

made for the Great Lakes ecosystem.

Despite the significance of the Great Lakes and our collective rhetoric to restore and enhance them, we as a society continue to mortgage their future by poisoning, suffocating and otherwise threatening them because of insufficient knowledge, other priorities and short-sightedness.

What our generation has failed to realize is that, what we are doing to the Great Lakes, we are doing to ourselves and to our children.

This report discusses some of the reasons for and the implications of this statement and presents a number of recommendations for urgent and focused attention. While primarily addressed to the Parties and to the states and provinces (the jurisdictions) bordering the Great Lakes, these recommendations are also pertinent to decisions made and actions taken by nongovernmental organizations and individuals. The recommendations are organized into principal issues, each with brief discussion and specific subsidiary points.

PERSISTENT TOXIC SUBSTANCES THREATEN HUMAN HEALTH

We have concluded from wildlife and laboratory animal information that persistent toxic substances in the Great Lakes Basin Ecosystem pose serious health risks to living organisms. Sixteen Great Lakes wildlife species near the top of the food web have had reproductive problems or declines in populations at one time or another since 1950. In each case, high concentrations of contaminants have been found in animal tissue. Together with available human data, the information leads us to conclude that persistent toxic substances in the Great Lakes environment also threaten human health. It would be unwise and imprudent not to take immediate action. As our first general recommendation, we urge the Parties to:

I. take every available action to stop the inflow of persistent toxic substances into the Great Lakes environment.

Specifically, we recommend:

1. the Parties complete and implement immediately a binational toxic substances management strategy to provide a coordinated framework for accomplishing, as soon and as fully as possible, the Agreement philosophy of zero discharge.

2. the Parties and all levels of government, including local authorities, cooperatively develop and implement appropriate legislation, standards and/or other regulatory measures that will give enforceable effect to the principles and objectives of the Agreement on a basinwide basis.

3. additional review and coordination measures be put

into effect to ensure other legislation and/or regulations presently in place that affect matters relevant to the Great Lakes environment—or those enacted in the future—are not inconsistent with Agreement Objectives.

4. the measures devised pursuant to the foregoing include provisions for initiation, implementation and coordination of action at all levels of government to enforce the enacted laws and/or regulations.

5. the Parties strengthen the principle of reverse onus in policies and programs concerned with the introduction of new chemicals, through appropriate legislation and/or regulations that include mandatory pretesting prior to approval for production and use.

6. the Parties, in their next biennial reports to the Commission pursuant to Annex 12:

- *report on the extent to which discharges of 11 critical pollutants previously identified by the Great Lakes Water Quality Board — and known to have serious detrimental effects on living organisms—have been explicitly considered in the issuance of National Pollutant Discharge Elimination System (NPDES) permits and control orders.*
- *assure the Commission and the public that no municipal, industrial or combined sewer overflow discharges of these substances are or will be permitted.*

- *assess and report on the extent to which these 11 substances are used, stored and released in the basin by nonpoint rural and urban sources, including landfills and groundwater, and the measures being taken to prevent their further release into the Great Lakes from these sources.*
- *report on the extent to which monitoring is in place to confirm that discharges of these chemicals are not occurring.*

7. the Parties designate Lake Superior as a demonstration area where no point source discharge of any persistent toxic substance will be permitted. This recommendation should not prejudice or delay the implementation of our other recommendations.

8. The Parties sponsor and fund research projects to:

- *replicate and expand on studies which demonstrate relationships between chemical exposure and human health in the Great Lakes basin and elsewhere;*
- *identify other exposed populations and biological species and investigate the effects of chemical exposures on them.*

Discussion

Agreement Obligations Concerning Persistent Toxic Substances The 1972 Agreement, the 1978 Agreement and the 1987 Protocol all recognize the need to address problems associated with toxic contaminants. The amended Agreement commits

both nations to the policy:

> "The discharge of toxic substances in toxic amounts be prohibited and the discharge of any or all persistent toxic substances be virtually eliminated."

Further, Annex 12 specifies:

> "The intent of programs ... is to virtually eliminate the input of persistent toxic substances in order to protect human health and to ensure the continued health and productivity of living aquatic resources and human use thereof [and] the philosophy adopted for control of inputs of persistent toxic substances shall be zero discharge."

The Agreement in general, and its toxic substances provisions in particular, represent an extraordinary undertaking by two nations to recognize, reduce and eventually eliminate chemicals which are harmful to the health of their citizens.

The Need for a Coordinated Strategy and Immediate Action

The Commission has communicated on several occasions its perceptions of the adequacy of the governments' responses to their Agreement obligations. While the Parties, states and provinces have responded to environmental issues through legislation, regulation, modified programs and management practices, there is no clear indication they consistently and comprehensively support the intentions of the Agreement as a priority, with specific actions and adequate resources. Two examples are provided.

In May 1980, the Commission asked the Governments of Canada and the United States whether the jurisdictions incorporated provisions for specific point source discharges into their permit granting and other regulatory processes that were adequate to achieve the Purpose and Objectives of the Agreement; or, alternatively, whether the Parties were taking steps to ensure this would occur. The Commission received general responses from the Parties that steps were being taken to ensure that pollution control regulations take account of Agreement objectives. However, detailed information is still lacking on how those objectives are being achieved for all toxic substances or whether they can all be achieved under current requirements in the various jurisdictions. This absence, together with existing data on compliance with jurisdictional orders and permits, suggests the Commission's question, which is so central to the provisions of the Agreement, is still not being systematically and comprehensively addressed.

In 1981, the Commission's Great Lakes Water Quality Board found the Parties and jurisdictions lacked an overall strategy for toxic substances control activities. The absence of such a strategy means limited resources are being used in uncoordinated and possibly inconsistent programs in many different jurisdictions and agencies. In previous biennial reports, the Commission recommended a binational Great Lakes toxics management strategy be developed, and suggested elements of such a strategy. However,

there has been little movement by the Parties to implement an effective overall, coordinated toxic substance control strategy.

A binational, multi-agency, multi-jurisdictional effort is required at a level not yet conceived, much less realized. This effort must expand beyond traditional pollution control efforts and the present work of pollution control agencies to involve and provide adequate resources for a wide range of agencies, including those responsible for fish and wildlife and public health and welfare. Coordination is needed at the federal and jurisdictional levels in both nations to participate directly in this work. The Agreement provides the necessary umbrella for such coordination.

One part of the Commission's recommended strategy has been rehabilitation of the 42 Areas of Concern identified in the Great Lakes basin. Indeed, the Parties have committed themselves to restore and protect beneficial uses in these areas (e.g. edible fish and swimmable water). This admirable undertaking may well be the centrepiece of the 1987 Protocol. Actual program implementation has yet to begin in most areas, however, and there is a substantial list of Areas of Concern for which plans have yet to be submitted.

There are other Commission recommendations to which the Parties have not responded, and commitments made by the Parties that have not been fulfilled. The issues described above receive special mention because they are central to achieving real progress

on what the Commission considers are continuing and growing dangers posed to living organisms, including humans, by the presence of persistent toxic chemicals in the Great Lakes environment. These persistent toxic chemicals continue to find their way into the environment from numerous sources and through various routes; once in the system they, within the human time scale, do not disappear — they accumulate. There is growing evidence that their presence in the bodies, eggs and offspring of the animals, birds, fish and other biota of the Great Lakes ecosystem is resulting in a number of gross effects. These same toxic chemicals are found in humans.

The Human Health Threat In recent years, cancer has reigned supreme among diseases which frighten humankind. Cancer risk analysis has dominated the research and control agenda, and as a result it has become standard practice to use the cancer risk associated with various chemicals when developing regulations and guidelines for their use and disposal. Determining what constitutes a carcinogen has acquired a force of its own, and has been so hotly debated that research and regulatory control strategies for other serious detrimental effects of chemicals have often been neglected.

Now we are confronted with the knowledge that more subtle disease and dysfunctionality outcomes occur from living organisms' exposure to toxics in addition to — or rather than —

malignancies. Yet, programs that analyze the effects of toxic chemicals on biological development, reproduction, environmental epidemiology and noncarcinogenic disease have not fared well compared to programs dealing with cancer. The Commission is not suggesting that cancer and mutagenic based studies be neglected; this work should continue. However, in relation to the Agreement, it is time to give substantially increased emphasis to research programs on additional diseases and effects.

In their research, wildlife scientists have found diseases and indicators of effects that merit greater attention by public health scientists. The Great Lakes have been a rich source of such data, yielding information that a number of serious impacts which are neither carcinogenic nor mutagenic are occurring in a large number of Great Lakes fish, birds, reptiles and small mammals. In most instances, these effects include population declines, reproductive problems, eggshell thinning, severe metabolic changes, gross deformities, behaviourial and hormonal changes and immunosuppression. These effects occur in offspring, the apparent result of maternal transfer.

The growing public awareness that toxics are affecting certain fish, reptile and small mammal populations raises two fundamental and sobering questions: Are humans in danger? Are future generations in danger?

The only rigorous study undertaken to date on humans in the

Great Lakes basin looked at mothers in western Michigan who ate Lake Michigan fish on a regular basis. The study's results provide ample reason to strongly suspect exposure to chemicals, particularly certain PCBs, was damaging to the offspring of those mothers. The researchers found the length of the gestational period, birth weight, skull circumference and cognitive, motor and behavioural development of the infants were adversely affected by the mothers' lifetime consumption of Lake Michigan fish. The researchers also found the amount of certain PCBs found in infant umbilical cord serum was associated with a decrease in visual recognition memory.

When available data on fish, birds, reptiles and small mammals are considered along with this human research, the Commission must conclude that there is a threat to the health of our children emanating from our exposure to persistent toxic substances, even at very low ambient levels.

This threat is posed by continuing exposure to chemicals produced intentionally and unintentionally, including PCBs, dioxin, furan, hexachlorobenzene, DDT and its metabolites, dieldrin, lead and mercury. All of these chemicals are widely found in the Great Lakes Basin Ecosystem.

The mounting evidence cannot be denied. Governments must emphasize development and implementation of a comprehensive, binational program to lessen the use of, and human exposure to,

persistent toxic chemicals found in the Great Lakes environment. These chemicals appear to be causing serious and fundamental physiological and other impacts on animal populations in the Great Lakes basin, and undoubtedly elsewhere. The dangers posed to the ecosystem, including humans, by the continuing use and release of persistent toxic contaminants are severe.

It is not sufficient to respond to such a threat by reciting a list of existing programs and their merits. The Parties instead must publicly define specific, adequately funded programs that aim to achieve the Purpose and Objectives of the Agreement. To provide adequate funding for these programs, the participation of a substantial number of federal and jurisdictional agencies, including those responsible for economic, regional development and fiscal matters, will be required.

The Way Ahead: Premises The serious and widespread problem of persistent toxic substances in the Great Lakes biosystem requires an approach that enables the Parties, jurisdictions, municipalities and individuals in the Great Lakes basin to collectively lessen the current threat to the ecosystem. The premises for such an approach are:

i. All persistent toxic substances are ultimately harmful to the integrity of the environment, both in the Great Lakes region and globally, and should not be allowed to enter the environment.

ii. Persistent toxic substances find their way into the environment in many ways, through production, residuals discharge, use and destruction.

iii. The technology either exists — or can, with very few exceptions, be developed at some cost — to replace (or control in the interim) the use of persistent toxic substances.

iv. Sufficient information is now known for society to take a very restrictive approach to allowing persistent toxic substances in the ecosystem and to declare such materials too risky to the biosphere and humans to permit their release in any quantity. They result in implications far beyond conventional measures of long-term net economic costs referred to in premise iii.

Thus, the Agreement's zero discharge philosophy must become a reality as soon as technologically possible. While the Parties' strategy to regulate producers is required to ensure action by the primary sources of persistent toxic substances, it will not be a sufficient plan to achieve zero discharge. A much more comprehensive and systematic strategy is required.

Substances that have important uses and for which substitutes cannot be found immediately must be produced, used and subsequently recycled or neutralized under the most stringent protective conditions to ensure they do not enter the environment. Substances for which zero discharge cannot be assured must be phased out of

use as soon as possible. Target dates for the staged reduction and early elimination of these substances should be set in the very near future and strictly enforced by incorporating them into appropriate parts of the legislative program discussed below.

It may be questioned whether society is willing to bear the costs of rejecting or modifying the products and processes which create or discharge persistent toxic substances. Clearly, however, the cost of inaction or insufficient action is, in the long run, vastly greater than the cost of timely action now.

These premises provide the rationale for employing a bold approach to **prevent** the further introduction of persistent toxic substances into the basin, to assist people to **avoid** contact with those substances already in the system, and to **remediate** those already contaminated areas. The measures described in the remainder of this report address one or more elements of this "prevent, avoid and remediate" strategy which must be adopted at local, state/provincial, regional, national and even global levels.

Ensuring Adequate Legislation and Regulations In Part I of this Fifth Biennial Report, the Commission summarized the public's concerns for the lack of legislation which translates the principles of the Agreement into specific, enforceable enactments. The public expressed the need for a comprehensive system to examine all relevant existing and proposed laws to ensure they are consistent with the Agreement and related legislation or regula-

tions. In its 1989 report, the Great Lakes Water Quality Board also pointed out that the existing complex regulatory framework limits the ability of governments to achieve the Agreement's Purpose and Objectives.

The Commission continues to concur with these views, which reflect its longstanding position on this issue. **It has noted on a number of occasions the importance of translating the Objectives of the Agreement explicitly into the domestic laws and regulations of both nations.** While the Commission recognizes this is a far-reaching and difficult task, it believes it is crucial to ensuring full realization and application of Agreement objectives.

Another important thrust must be the rapid and intensive development of alternatives to materials, products and processes that release persistent toxic substances to the environment. Alternative product formulations must be developed to meet current product and process requirements without using persistent toxic substances, and consumer demands must shift to lessen the use of resources and other materials that stress the environment through recycling, recovery of hazardous materials, and changes in overall consumer expectations. In short, society must move towards patterns of sustainable rather than destructive economic development.

Progress can be made toward more environmentally conscious practices in land use management in rural and urban settings through programs to encourage, demonstrate and provide assis-

tance to develop better land use management techniques. Much has been learned, for example, about erosion and siltation control. It is not clear, however, how widely these controls have been practised since the Commission first recommended such measures in its 1980 report under the Pollution from Land Use Activities Reference.

Regulatory remedies continue to apply to two broad problem categories: cleanup of old and existing sources of pollution and controlling sources which continue to produce pollution. While abandoned waste dumps, contaminants in sediment and severely contaminated biological resources do not produce new levels of pollution, they continue to contribute to the ecosystem's degradation. Governmental action involving large sums of money will be required in instances where those responsible for the problem can no longer be held accountable.

Continuing sources of pollution must be brought under control by tightening, extending and strictly enforcing regulatory requirements. Generators of this continuing pollution should, as a general rule, bear the costs of its prevention and remediation. Increasingly, diffuse or nonpoint sources also are recognized as significant sources. Opportunities to use existing regulatory mechanisms to control pollution from agricultural producers, commercial enterprises, urban construction activity, households and the atmosphere, as well as other measures, should be explored.

Because pollutants also travel within and enter the basin by atmospheric transport, the persistent toxic substances problem in the Great Lakes takes on national and international dimensions. To some degree, toxic pollution is being imported into the Great Lakes from thousands of miles away. In the case of some persistent toxic substances, this may mean the complete removal of substances from emissions, perhaps over a large area extending beyond the Great Lakes. Unless this problem is addressed and tackled, the environmental and public health problems of the Great Lakes cannot be totally solved and the Agreement Purpose cannot be achieved.

Reverse Onus **An essential part of the strategy to stop the introduction of persistent toxic chemicals into the Great Lakes Basin Ecosystem must be to prevent new, harmful chemicals from entering the market place.** The Commission endorses the principle of reverse onus in this regard; that is, when approval is sought for the manufacture, use or discharge of any substance which will or may enter the environment, the applicant must prove, as a general rule, that the substance is not harmful to the environment or human health. The Canadian Environmental Protection Act requires the Federal Government be provided with prescribed toxicity information for any new substance entering commerce. On the basis of that information, introduction of the substance can be prohibited, permitted under certain controls and conditions, or

delayed pending additional information and assessment. The United States Toxic Substances Control Act appears to have incorporated the principle of reverse onus. However, rather than mandating testing, the act only requires companies to submit results of tests completed voluntarily to the U.S. Environmental Protection Agency when providing notification of their intent to manufacture a new chemical. The Commission emphasizes the need to incorporate the principle of reverse onus into the regulatory framework, including the mandatory pretesting of new chemicals prior to approval for production and use. This procedure will only be as good, however, as the stringency of testing protocols and the consistency of their application.

The Parties have endorsed the philosophy of zero discharge of persistent toxic substances in the Agreement. Yet it is unclear the extent to which this philosophy is being incorporated into discharge permits and control orders for point source, municipal and combined sewer overflow releases. In its 1985 report, the Great Lakes Water Quality Board designated 11 critical pollutants: total PCB, mirex, hexachlorobenzene, dieldrin, DDT and its metabolites, 2,3,7,8-tetrachlorodibenzo-p-dioxin, 2,3,7,8-tetrachlorodibenzofuran, benzo-a-pyrene, alkylated lead, toxaphene and mercury. Several of these have been previously cited in this report as threats to human health.

One measure of whether the philosophy of zero discharge is

being taken into account is the extent to which these critical pollutants are explicitly considered in the issuance of discharge permits and control orders. Accordingly, the Commission offers the above recommendations which, if implemented, would give effect to the philosophy of zero discharge by dealing seriously and specifically with an initial, limited set of contaminants known to have serious detrimental effects on living organisms. The Commission believes the approach collectively outlined by its recommendations is essential and required to accomplish zero discharge of persistent toxic substances into the Great Lakes environment.

Using Lake Superior as a Pilot for Zero Discharge In general, Lake Superior remains a pristine body of water. While much of the toxic loading to Lake Superior is the result of atmospheric deposition, there are point source inputs. In its 1979 Report to Governments on Water Quality of the Upper Great Lakes, the Commission recommended that the Parties implement regulatory and remedial measures to eliminate point source pollution on the upper Great Lakes and thereby restore water quality. The Commission also recommended that surveillance, monitoring and research activities be undertaken on the upper lakes to assure restoration and maintenance of water quality. These recommendations are consistent with the policy of the Parties that the discharge of toxic substances in toxic amounts be prohibited and the discharge of any or all persistent toxic substances be virtually eliminated. Indeed, Article

IV of the Agreement states:

> "... measures shall be taken to maintain or improve the existing water quality in those areas ... where such water quality is better than that prescribed by the Specific Objectives, and in those areas having outstanding natural resource value."

The Commission recognizes that a program to end point source discharges of persistent toxic substances anywhere in the basin, as described in the Commission's recommendations and in the admirable pledges of the Parties noted above, will not be easy. However, we must start somewhere. Lake Superior presents an opportunity for the Parties and relevant jurisdictions to demonstrate they are willing to take one step in a strategy towards zero discharge. This step will also help to retain the generally pristine condition of the Lake Superior environment.

The Commission therefore recommends the Parties designate Lake Superior as a demonstration area where no point source discharge of any persistent toxic substance will be permitted. This recommendation should not prejudice or delay the implementation of our other recommendations.

Research The Commission concludes that sufficient data exist to mandate actions that would prevent the continued manufacture of, and human exposure to, persistent toxic substances and to promote remediation of areas contaminated by these substances.

This conclusion does not, however, obviate the need for continuing research. The Commission calls attention to the research recommendations in the 1989 report of its Great Lakes Science Advisory Board, especially those on page 17. There is merit in continuing and expanding research projects that demonstrate relationships between chemical exposures and health in human populations in the Great Lakes Basin Ecosystem and elsewhere, and to identifying other exposed biological species and investigating for similar effects.

IMPLEMENTING THE AGREEMENT AT THE STATE, PROVINCIAL AND LOCAL LEVELS

We have noted on several occasions, particularly in previous biennial reports, that the Parties alone cannot fully implement the various provisions of the Agreement. Many aspects also lie within the mandates of other levels of government and the private sector. The full power of the Agreement can only be effective with the understanding, the determined will and the participation of every person in the basin and beyond. Long-term environmental integrity must become the business of everyone and a matter of policy in governmental spheres. The adoption of such an ethic and sense of responsibility should be encouraged and assisted by senior levels of government. Therefore, our second general recommendation is:

II. all levels of government accept, and encourage others to accept, their responsibility to implement the Great Lakes Water Quality Agreement, and give priority to actions that contribute to the protection and restoration of the Great Lakes Basin Ecosystem.

Specifically, we recommend:

1. the Parties and jurisdictions fully inform and involve local governments with respect to their potential contribution towards achieving the Purpose and Objectives of the Agreement, and local governments accept responsibility to assist in the implementation of the Agreement.

2. the Parties and jurisdictions review and strengthen Great Lakes fish consumption advisories as necessary, and

re-evaluate stocking programs for those fish which pose a threat to the health of animals and humans when consumed.

3. the Parties prepare and urge the use of a comprehensive public information and education program.

4. the Great Lakes states and provinces incorporate the Great Lakes ecosystem as a priority topic in existing school curricula.

5. jurisdictions use Great Lakes Areas of Concern as focal points for the development of educational programs and materials.

Discussion

The Commission repeats its admonition from previous biennial reports that the Parties cannot implement the provisions and intent of the Agreement alone. The issue before us is of societal, even global dimensions. To expect the Parties alone to address and fund this issue effectively is to invite failure. But the Governments of Canada and the United States can and must be the catalyst for exploring funding alternatives in addition to providing federal funds. These alternatives could include formally arranged federal/jurisdictional and government/private sector cost sharing. Individuals, professional, citizen and other organizations, municipalities and the business sector must be part of the overall effort.

States and provinces must look to their own current and future resources — natural, human and financial. Actions such as the

Great Lakes Protection Fund, the provincial roundtables, the Michigan bond program and the growing commitment to the Remedial Action Plan process are all examples of positive efforts. Explicit policies and programs are needed to ensure a future which is dependent on the sustainability of the resources of the Great Lakes. But federal leadership is required in both countries and it is the responsibility of the Parties to ensure their commitments under the Agreement are met.

Municipalities must take greater responsibility in zoning and other regulations for activities within their boundaries. Local bylaw enforcement and educational and public health measures are parts of the larger Great Lakes picture. Considerable expertise and a special sensitivity to public concerns and remedial or preventive opportunities can be found among local municipal councils, staffs and citizen groups and should be incorporated into management schemes.

Decisions on product purchases, zoning and development design, public works, solid waste management and urban transport, for example, all can be sensitive to environmental needs. Local governments also can influence public involvement and concern by bringing these issues, and their implications, close to home. As local governments often lack the resources and expertise to carry out the actions required to achieve the Purpose and Objectives of the Agreement, the Parties must more effectively inform and assist

them in accepting these responsibilities.

The formation of new municipal organizations such as the International Association of Great Lakes Mayors is a positive step, but just a beginning. Organizations and communities of people everywhere must get involved in sound planning and decisionmaking, and thereby take personal and collective responsibility for a sustainable future for the lakes.

Fish Consumption Advisories: An Exercise in Contradiction?

Catching Great Lakes fish is the passion of many thousands of Great Lakes residents and others, and this activity is encouraged by governments to develop and promote the sports fishery. For this and other reasons, governments stock fish in the lakes.

The consumption of Great Lakes fish, however, is the principal source of human exposure to a number of persistent toxic compounds. Consumption of certain fish species poses a special threat to women of child-bearing age, who pass these toxic substances on to their offspring. As a result, fish species that are the subject of consumption advisories by one government agency may continue to be stocked by another. Because of these inconsistencies in advisories and other fisheries management policies among jurisdictions, conflicting messages are sent to anglers.

These two facts seem strangely inconsistent and troublesome. Indeed, they have been branded an exercise in contradiction. The Commission concludes the Parties and jurisdictions should review

and strengthen Great Lakes fish consumption advisories as necessary and re-evaluate stocking programs for those fish which pose a threat to the health of animals and humans when consumed.

Informing and Involving the Public Society is realizing consumer and corporate patterns, coupled with the lack of environmental policies — or lack of enforcement of existing policies — are the primary causes for environmental contamination. Education can be an effective tool to encourage greater awareness and assist people in avoiding personal use of and exposure to persistent toxic substances. Until such educational opportunities are provided, society will continue to face today's environmental problems in the future and breed new ones.

Environmental education programs must be developed and implemented for the general public and for the classroom. As greater attention is given to environmental issues, adults will need to obtain accurate and timely responses from their local governments: How is pollution entering our environment? What and where can one recycle? Is paper or plastic better? Can biodegradable packaging and products really decay quickly and safely? What chemicals and foods should be avoided?

Recent polls indicate up to 90% of consumers are willing to pay more for products and give up certain conveniences in exchange for products that will not damage the environment or human health. Local communities can take advantage of this opportunity

to respond through a variety of mechanisms. Community-wide distribution of information materials on recycling projects, seminars and workshops on environmentally safe consumer practices hosted by community colleges, schools and organizations, and other similar programs will assist consumers to reflect on their own behaviour and values, and change those actions which are contributing to the ecosystem's degradation.

Communities can in turn benefit from such awareness by involving citizens in the development and implementation of recycling and other community action projects. While knowledge will help individuals understand the total environment and their role in it, participation in such projects will ensure that a sense of responsibility and commitment to environmentally appropriate actions is sustained over the long term.

To raise the level of knowledge among the general public about the importance of a clean environment and what individuals can do to prevent, avoid and remediate degradation of the ecosystem, the Commission again recommends the Parties prepare and urge the use of a comprehensive public information and education program.

Such a program can be used by all levels of government and include adult and employee education programs and involvement by civic, labour, professional and service clubs and organizations, public service television and radio programs, and articles for the

print and other media. In the preparation and execution of the above program, the Commission further suggests the Parties enlist the volunteer assistance of the many nongovernmental organizations concerned about the health of the Great Lakes-St. Lawrence River ecosystem.

Environmental Education for Children Informational and participatory programs which address consumer habits can help individuals alter their lifestyles to reflect a greater concern and desire for environmental integrity. A strong and coordinated approach is required by the educational system, however, to instill in children a sustained awareness and respect for the interdependence of all elements of the ecosystem, as well as a desire to act on this knowledge. Today's youth will make tomorrow's decisions as consumers using the knowledge and values gained, for the most part, from their educational experiences. Because environmental issues involve all elements of the human system — social, economic, technological, scientific and political — they provide a unique opportunity for students to explore issues that are relevant to their own lives, while still in the classroom setting.

Research by the Great Lakes Commission's Education Task Force, Ohio Sea Grant and others has shown that information provided on the Great Lakes in the formal educational setting is limited and varies greatly in length and depth. A 1983 Ohio survey found 54% of fifth grade students and 40% of ninth grade students

could not identify Lake Erie on a map of the Great Lakes. Other studies suggest these findings are not unique to Ohio students.

The sustained educational leadership necessary to incorporate Great Lakes materials and information into curricula is lacking, despite recent efforts to promote Great Lakes education by a variety of agencies and organizations, including the Commission's Great Lakes Science Advisory Board. Educational efforts should focus on the lakes, their value to the region's wellbeing, and the individual's and society's role in assuring the health of the ecosystem.

Such efforts require extensive support and commitment from a variety of entities — including state, provincial and local governments, industries, and particularly professional teacher associations and nongovernmental organizations — to help teachers learn about Great Lakes issues and pass that knowledge on to their students. The jurisdictions can assist in this effort by supporting the development of appropriate Great Lakes educational materials and teacher training workshops. Such materials and programs could be housed in a readily accessible, binational educators' clearinghouse on the Great Lakes.

The development and implementation of Remedial Action Plans for Areas of Concern presents a unique opportunity for the educational community to teach children about Great Lakes ecosystem issues, using those faced in each local Area of Concern as

symptoms of broader basinwide concerns. One innovative and action-oriented educational program — the Rouge River Integrated Monitoring Project in Michigan — is gradually being used as a model in other Areas of Concern and in other parts of the world as well. The program helps students become aware of their surrounding environment and take steps to clean up the river, while at the same time learn about the effects human actions have on the local, regional and global environment. Such a coordinated program for each Area of Concern could greatly enhance children's (and adults') understanding of the causes and effects of pollution on the Great Lakes ecosystem, and encourage the development of more environmentally conscious behaviour in each individual.

The issues the Great Lakes region faces are not unique to the region. Rather, they are symptoms of a human system which tries to control, rather than live within, the environment surrounding it. A well educated and motivated population, which understands that humans are a part of — and not separate from — the environment, is our best assurance that effective action will be taken to restore and protect the Great Lakes Basin Ecosystem.

REMEDIAL ACTION PLANS

As a result of a 1985 recommendation of the Great Lakes Water Quality Board, the eight Great Lakes states and Ontario committed themselves to developing Remedial Action Plans (RAPs) to restore beneficial uses in Areas of Concern within their political boundaries. In addition to identifying environmental problems, sources and causes of these problems, each RAP must identify when specific remedial actions will be taken to resolve the problems and who is responsible for implementing these actions, in an effort to increase accountability. The incorporation of RAPs into the 1987 Protocol endorsed and built on the efforts initiated by the Board in 1985. Each RAP is to be submitted to the Commission for comment at three stages of development and implementation.

While one of the Commission's Agreement responsibilities is to review and comment on the adequacy of specific RAPs, overall progress in implementation of RAPs is also tracked. To date, we have reviewed and commented on several plans; all except Green Bay failed to achieve an adequate Stage 1 presentation or to take a comprehensive ecosystem approach required by Annex 2. To ensure Stage 1 requirements are met for Remedial Action Plans pursuant to Annex 2 of the Agreement, we make our third general recommendation that:

III. the Parties give high priority to the development and implementation of RAPs, taking into account the need for public involvement throughout the process.

Specifically, we recommend:

1. the responsible Parties and jurisdictions revise all RAPs that the Commission has found do not meet Stage 1 requirements.

2. the responsible jurisdictions accelerate the preparation and submission of RAPs for the remaining Areas of Concern and provide the technical and financial resources needed for their implementation.

3. the Parties and jurisdictions encourage the participation of interested organizations and individuals throughout RAP development and implementation by sustaining community participation groups already established, and creating comparable institutional mechanisms in the other Areas of Concern.

4. the jurisdictions include a detailed plan for public participation as part of the Stage 1 submission of RAPs.

Discussion

Considerable progress can be made in restoring Areas of Concern by using the RAP development and implementation process to focus attention, secure commitment and coordinate efforts. The revised Agreement provides a solid framework that calls for a comprehensive and systematic approach while, at the same time, provides for specific targets and timetables. It is particularly important that each plan identify beneficial use im-

pairments consistent with the 14 use impairments in Annex 2, and all cause-and-effect relationships and sources of contaminants also are adequately identified.

The Commission has reviewed a number of RAPs and is in the process of reviewing several others, but most of the 42 plans have not yet been submitted for initial review. In some cases, little progress has been made to develop these plans. Accordingly, the preparation and submission of RAPs should be accelerated for the remaining Areas of Concern. Enhanced funding and technical resources for development and implementation of RAPs will be required.

If RAPs are to be effectively implemented, they may require the force of law. Such laws, if found necessary to achieve the requirements of Annex 2, should include reference to the direction, authority and funding for RAPs. Further, existing laws must be promptly enforced so those polluters responsible for creating the problems will bear a fair share of the cost of cleanup and restoration. This may be accomplished voluntarily or through fines, penalties and consent agreements that focus additional commitments on preventing further pollution of the area.

Lack of agreement on problem definition has been used as a reason to delay remedial actions in Areas of Concern. RAPs are not merely a planning exercise; they are intended to result in implementation of specific remedial actions to restore impaired benefi-

cial uses and incorporate preventive measures against future degradation. RAPs are a unique experiment in institutional cooperation and the first opportunity, on a broad and practical scale, to implement the ecosystem approach to environmental restoration in the Great Lakes basin.

Involving Stakeholders The ecosystem approach takes account of the interrelationships among water, land, air and all living things, including humans. An important element of incorporating the ecosystem approach in RAPs is to consider, as appropriate, the economic, social and institutional factors affecting each Area of Concern. Such consideration must involve all user groups in policymaking and management. Mechanisms that provide for broad participation in these areas, such as a stakeholder group, citizen advisory committee or comparable entity representing the various interests in the Area of Concern, provide an opportunity to change the traditional way of doing business and create a foundation to assure the resources necessary to accomplish the plan's purpose. They must, however, be formed early in the process so all interests can become involved, from the initial planning and problem identification phase through implementation and confirmation that all beneficial uses have been restored.

The Commission believes citizen participation should be encouraged throughout the RAP process. The Parties and jurisdictions should assist in sustaining community participation groups

already established in Areas of Concern, as well as focus additional efforts on establishing comparable institutional structures in other Areas of Concern. In order for the Commission to ensure these efforts are being undertaken, jurisdictions should provide a detailed plan for public involvement and consultation in its Stage 1 documentation or earlier.

The institutional structures established in Areas of Concern have encouraged local ownership of RAPs and the development of a common vision for the Area of Concern through the process of setting RAP goals. Once there is agreement on these goals, stakeholders can identify the needed remedial actions and help to determine who is responsible for implementing them. Mechanisms such as stakeholder groups and citizen advisory committees should remain active and continue to meet regularly to help ensure accountability during RAP implementation until all goals are met. Annual progress reports and "state-of-the-RAP" events keep the general public aware of progress in implementing the RAP, sustain public confidence and support, and help ensure accountability and sustainability.

The Commission believes the Parties and jurisdictions are in an enviable position, now that the RAP institutional bases are in place. These arrangements, which tend to bring together a range of government agencies, the private sector and citizens, provide a strong foundation for moving forward on RAPs. Indeed, they can

chart a future for each Area of Concern that avoids the environmental problems of the past and simultaneously plans for environmental and economic prosperity. Some solutions will call for technical, legal and economic advances, and will also require changes in many of the ways in which we live.

SPILLS: POTENTIAL FOR CATASTROPHE

Shipping and shore-based industrial operations constitute a significant latent source of chemical contamination. They have the potential to impose serious long-term catastrophic disruption of drinking water supplies for 25 million Great Lakes residents, as well as massive disruption of the biosystem. The sobering effects of the Exxon Valdez incident in Alaska are well documented; the Great Lakes are not immune to such events. Our fourth general recommendation concerns protection against spills, and thus suggests that:

IV. the Parties strengthen and adopt provisions for the prevention of spills of toxic and other hazardous substances from vessels and other sources, and ensure they are prepared to deal with emergencies that may arise.

Specifically, we recommend:

1. the Parties increase pilotage requirements for all vessels carrying oil and hazardous substances in the Great Lakes.

2. the Parties improve communication and tracking of all vessels carrying oil and hazardous cargoes.

3. the Parties enhance the capability of the Coast Guard and other relevant agencies to respond to all spills of oil and hazardous polluting substances.

4. the Parties review the adequacy of funding for spill-related monitoring and enforcement.

5. the Parties examine the extent to which the provisions of Annexes 4, 5, 6, 8 and 9 have been complied with, and take appropriate steps to remediate any deficiencies.

Discussion

Under normal circumstances, the substantial quantities of hazardous polluting substances carried aboard ships and other transportation media and the wide range of substances produced, used or handled in shore-based operations do not constitute a significant threat. However, spills, process upsets and other unplanned releases, whether accidental or intentional, constitute a major but avoidable source of contamination. In one documented incident, which demonstrates the magnitude of this problem, 80,000 kg (176,000 lbs) of a hazardous polluting substance called styrene was released into the St. Clair River. With this one event, the facility in question released a quantity roughly equivalent to the amount it was permitted to discharge in its regulated effluent over a 1,400-year period.

Evidence gathered by the Great Lakes Water Quality and Science Advisory Boards indicates spills and unplanned releases are commonplace. The number of annual verified incidents is in the hundreds; most involve oil and other hazardous polluting substances. The Boards reported that surreptitious releases also occur. The extent and magnitude of such occurrences and their impact on human health and on the stability of the aquatic ecosystem are

largely unknown. In their review of available information, the Boards found that reports about unplanned releases are unclear and incomplete. The occurrence and reporting of incidents, the information reported, the responsible agencies, and data management are all noted problems. Notwithstanding the fragmentary nature of available data, **the Commission concludes that such unplanned and illicit releases constitute a significant source of contamination to the Great Lakes.**

Recent studies at Carnegie Mellon University, and other reports on the efficacy of spill response capability and containment equipment, clearly indicate the Great Lakes, its denizens and its water users have no significant protection against a major catastrophic spill. The ability to properly contain and clean up a spill — especially one into the open waters of the lakes — simply does not exist. The Carnegie Mellon study also highlighted other serious communication and coordination problems with spill response.

Unplanned releases are generally caused by human factors such as boredom, communication problems, lack of training, and inappropriate cargo handling practices. Technical factors such as equipment failure also contribute to the problem, as do illicit releases that result from open defiance of laws and regulations. Thus, effective programs are needed to respond to unplanned releases and, more importantly, to prevent such occurrences and discourage illegal discharges.

The Commission is concerned about the increased relaxation of pilotage requirements and the possibility that ships' crews illegally dump hazardous substances. The attendant risks could be reduced by requiring pilots in more cases and giving them a mandate to prevent potential problems. **The Parties should increase pilotage requirements for all vessels carrying oil and hazardous substances in the Great Lakes.** This includes pilot authority to control maximum vessel speed and course, and charts and training to protect drinking water intakes and identified ecologically sensitive zones.

In addition, there is a need to strengthen current systems of vessel traffic control and tracking to increase the chances of observing and correcting possibly dangerous situations. **The Parties should improve communication and tracking of all vessels with oil and hazardous cargoes, including the use of positive command and control systems.**

Recent experience has shown governmental agencies and shippers alike are less well prepared for emergencies than they might have thought. In a recent report, a Canadian public review panel observed that none have confirmed they are fully prepared to handle a major spill under any conditions. According to the Great Lakes Science Advisory Board, factors inhibiting this preparedness include the lack of human and other resources and inadequate coordination of emergency response measures. It would, therefore,

seem necessary to enhance the capability of the Coast Guard and other relevant agencies to respond to all spills of oil and hazardous polluting substances. Reviews of the adequacy of funding for spill-related monitoring and enforcement and a program to prevent spills and unplanned releases also are indicated.

Annexes four to nine in the Agreement set out a number of requirements for consultation and action in the area of spills and process upsets. Notwithstanding the annual joint reports of the Coast Guards, the Commission is not satisfied that all of these provisions have been fully satisfied or even considered in light of the reports of the Great Lakes Water Quality and Science Advisory Boards. A thorough review of the extent of compliance with the provisions of these annexes is required. It would be helpful and desirable if the Parties would advise the Commission of the results of this examination.

EXOTIC SPECIES

The introduction of foreign species to the Great Lakes Basin Ecosystem has the potential to cause serious disruption to the biotic community and the Great Lakes economy. One well-known example of biological contamination of the system is the sea lamprey, which decimated lake trout populations in the 1950s. Control efforts have cost over $100 million to date, with no permanent end in sight. Indirect costs are incalculable but include economic losses to the once-thriving commercial lake trout fishery and to the recreational sport fishery.

A more recent introduction is the ruffe, a small perch-like fish originating in Europe and now found in Lake Superior. The ruffe feeds on the larvae of whitefish and other valuable commercial fish and thus its presence could decimate the whitefish population.

A far more serious introduction is the zebra mussel, also originating in Europe. First found in Lake St. Clair in 1987, its range now includes that lake and all of Lake Erie, and it will shortly overtake Lake Ontario. The zebra mussel proliferates in massive numbers. Economic and biotic disruptions and consequences include:

- the colonization and eventual occlusion of municipal and industrial water intakes;
- encrustation of boat hulls, nets, navigational buoys and other surfaces;
- consumption of plankton, in competition with and to the

detriment of other biota, with consequent disruption of higher elements of the food chain, including fish;

- displacement of native crustaceans and molluscs from their habitat;
- possible elimination of fish spawning and nursery areas;
- serving as an intermediate host to parasites.

The potential costs — financial and otherwise — are incalculable but could far exceed any detriments caused by the sea lamprey.

The ruffe and zebra mussel were introduced to the Great Lakes by ocean-going ships. **The potential for introduction of other exotic species is real and such introduction could have calamitous consequences.** Given the economic and the ecosystemic threats posed by biological contamination, stronger measures must be taken to protect against further introductions.

In light of these serious considerations, the Commission wrote to the Parties in August 1989 encouraging action to prevent the further introduction of foreign species from vessel ballast waters. In March 1990, the Commission jointly sponsored a workshop on exotic species with the Great Lakes Fishery Commission. The results of this workshop will be reported separately with appropriate recommendations.

THE PARTIES' RESPONSE TO THIS REPORT

In this Fifth Biennial Report, we have stated our intention to be responsive to emerging issues and to report our assessments of progress on various aspects of the Agreement more frequently. Roundtables and special reports are examples of measures we will use to assist us.

Article VII of the Agreement directs the Commission to assist in implementation by, among other things, providing advice and recommendations to the Parties and state and provincial governments on matters covered in the Agreement. In order to meet this responsibility more effectively, it would be helpful if the Parties commented more frequently and comprehensively on progress being made to implement our recommendations. Should the Parties decide to reject or delay acting on certain recommendations, knowing the reasons would also be helpful. The semi-annual meetings of the Parties, where Agreement progress is discussed, may provide the opportunity to coordinate the development of such responses. Accordingly, our final general recommendation is:

V. in order for the Commission to better assist the Parties in implementing the Agreement, the Parties should respond to the Commission's recommendations following every other semi-annual meeting of the Parties. This response should include the status with respect to implementation of these recommendations or the reasons why a delay has occurred or action has not been taken.

SUMMARY OF RECOMMENDATIONS

As our first general recommendation, we urge the Parties to:

I. take every available action to stop the inflow of persistent toxic substances into the Great Lakes environment.

Specifically, we recommend:

1. the Parties complete and implement immediately a binational toxic substances management strategy to provide a coordinated framework for accomplishing, as soon and as fully as possible, the Agreement philosophy of zero discharge.

2. the Parties and all levels of government, including local authorities, cooperatively develop and implement appropriate legislation, standards and/or other regulatory measures that will give enforceable effect to the principles and objectives of the Agreement on a basinwide basis.

3. additional review and coordination measures be put into effect to ensure other legislation and/or regulations presently in place that affect matters relevant to the Great Lakes environment—or those enacted in the future—are not inconsistent with Agreement Objectives.

4. the measures devised pursuant to the foregoing include provisions for initiation, implementation and coordination of action at all levels of government to enforce the enacted laws and/or regulations.

5. the Parties strengthen the principle of reverse onus in policies and programs concerned with the introduction of

new chemicals, through appropriate legislation and/or regulations that include mandatory pretesting prior to approval for production and use.

6. the Parties, in their next biennial reports to the Commission pursuant to Annex 12:

- *report on the extent to which discharges of 11 critical pollutants previously identified by the Great Lakes Water Quality Board — and known to have serious detrimental effects on living organisms — have been explicitly considered in the issuance of National Pollutant Discharge Elimination System (NPDES) permits and control orders.*
- *assure the Commission and the public that no municipal, industrial or combined sewer overflow discharges of these substances are or will be permitted.*
- *assess and report on the extent to which these 11 substances are used, stored and released in the basin by nonpoint rural and urban sources, including landfills and groundwater, and the measures being taken to prevent their further release into the Great Lakes from these sources.*
- *report on the extent to which monitoring is in place to confirm that discharges of these chemicals are not occurring.*

7. the Parties designate Lake Superior as a demonstration area where no point source discharge of any persistent toxic substance will be permitted. This recommendation should not

prejudice or delay the implementation of our other recommendations.

8. The Parties sponsor and fund research projects to:

- *replicate and expand on studies which demonstrate relationships between chemical exposure and human health in the Great Lakes basin and elsewhere;*
- *identify other exposed populations and biological species and investigate the effects of chemical exposures on them.*

Our second general recommendation is:

II. all levels of government accept, and encourage others to accept, their responsibility to implement the Great Lakes Water Quality Agreement, and give priority to actions that contribute to the protection and restoration of the Great Lakes Basin Ecosystem.

Specifically, we recommend:

1. the Parties and jurisdictions fully inform and involve local governments with respect to their potential contribution towards achieving the Purpose and Objectives of the Agreement, and local governments accept responsibility to assist in the implementation of the Agreement.

2. the Parties and jurisdictions review and strengthen Great Lakes fish consumption advisories as necessary, and re-evaluate stocking programs for those fish which pose a

threat to the health of animals and humans when consumed.

3. the Parties prepare and urge the use of a comprehensive public information and education program.

4. the Great Lakes states and provinces incorporate the Great Lakes ecosystem as a priority topic in existing school curricula.

5. jurisdictions use Great Lakes Areas of Concern as focal points for the development of educational programs and materials.

To ensure Stage 1 requirements are met for Remedial Action Plans pursuant to Annex 2 of the Agreement, we make our third general recommendation that:

III. the Parties give high priority to the development and implementation of RAPs, taking into account the need for public involvement throughout the process.

Specifically, we recommend:

1. the responsible Parties and jurisdictions revise all RAPs that the Commission has found do not meet Stage 1 requirements.

2. the responsible jurisdictions accelerate the preparation and submission of RAPs for the remaining Areas of Concern and provide the technical and financial resources needed for their implementation.

3. the Parties and jurisdictions encourage the participa-

tion of interested organizations and individuals throughout RAP development and implementation by sustaining community participation groups already established, and creating comparable institutional mechanisms in the other Areas of Concern.

4. the jurisdictions include a detailed plan for public participation as part of the Stage 1 submission of RAPs.

Our fourth general recommendation concerns protection against spills, and thus suggests that:

IV. the Parties strengthen and adopt provisions for the prevention of spills of toxic and other hazardous substances from vessels and other sources, and ensure they are prepared to deal with emergencies that may arise.

Specifically, we recommend:

1. the Parties increase pilotage requirements for all vessels carrying oil and hazardous substances in the Great Lakes.

2. the Parties improve communication and tracking of all vessels carrying oil and hazardous cargoes.

3. the Parties enhance the capability of the Coast Guard and other relevant agencies to respond to all spills of oil and hazardous polluting substances.

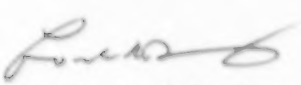
4. the Parties review the adequacy of funding for spill-related monitoring and enforcement.

5. the Parties examine the extent to which the provisions of Annexes 4, 5, 6, 8 and 9 have been complied with, and take appropriate steps to remediate any deficiencies.

Our final general recommendation is:

V. in order for the Commission to better assist the Parties in implementing the Agreement, the Parties should respond to the Commission's recommendations following every other semi-annual meeting of the Parties. This response should include the status with respect to implementation of these recommendations or the reasons why a delay has occurred or action has not been taken.

Signed this 16th day of March 1990 as Part II of the Fifth Biennial Report of the International Joint Commission pursuant to the Great Lakes Water Quality Agreement of 1978.

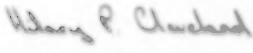


Gordon K. Durnil
Co-chairman

E. Davie Fulton
Co-chairman

Donald L. Totten
Commissioner

Robert S.K. Welch
Commissioner



Hilary P. Cleveland
Commissioner

Claude Lanthier
Commissioner